Mercury Bioaccumulation Assessment in Northern California Lakes and Reservoirs

Workplan for the 2000-02 Fiscal Years

Background

Aquatic organisms are excellent indicators of aquatic health and may be used to identify a variety of compounds potentially impacting beneficial uses that traditional water testing may not identify. Many aquatic organisms bioaccumulate contaminants, which makes the contaminant easier to identify, but may also lead to adverse effects to the organism or its predators. Mercury is a contaminant that is prevalent throughout the Central Valley of California. Yet, relatively little assessment of mercury in aquatic organisms has been conducted.

The Central Valley Regional Water Quality Control Board assessed mercury levels in fish, water, and sediments at sites throughout the Central Valley from data collected from 1976 to 1985. The RWQCB was concerned that beneficial uses of various water bodies may be impaired due to excessive levels of mercury. While noting that levels of mercury dissolved in water are usually low, bioaccumulation can occur that can lead to levels harmful to fish and their predators, including humans. Data from Black Butte Reservoir indicated that largemouth bass contained mercury concentrations up to 0.26 mg/kg, while white crappie contained concentrations up to 0.42 mg/kg.

The Office of Environmental Health Hazard Assessment published a report in 1999 that evaluated several chemicals in fish from Black Butte Reservoir, including mercury. Mean concentrations of mercury identified in this study ranged from 0.34 mg/kg for crappie to 0.70 mg/kg for largemouth bass. Based on these analyses, OEHHA issued a health advisory which recommended limiting consumption of fish from Black Butte Reservoir.

Many other lakes and reservoirs in northern California may also contain elevated levels of mercury. Mercury occurs naturally in the Coast Range, where it was mined and transported to the Sierra Nevada range during the gold mining era. In addition, deposition from atmospheric mercury may also lead to bioaccumulation in aquatic organisms in other areas.

Monitoring Program

Sampling will begin in May of 2000, with a goal of completion by August. Methods to collect fish will include hook and line, gill nets, seines, and trot lines. Prior to sampling with gill nets and trot lines, written permission will be obtained from the Department of Fish and Game. At least one person in the collection crew will have a valid scientific collection permit.

Several species of fish will be collected for tissue analyses of mercury from 18 lakes and reservoirs in northern California (Table 1) and the Colusa Basin Drain. Two to three size classes for one species in each of three families of fish (Salmonidae,

Centrarchidae, and Ictaluridae) will be collected. At least three, but preferably five, fish of similar size (no more than 75 percent difference in length) for the three species should be collected for each size class.

Total length and weight will be measured in the field. Salmonids and centrarchids will be aged from scales taken above the lateral line and behind the pectoral fin, respectively, while ictalurids will be aged by cross section analysis of the pectoral spine. Live collected fish will be wrapped in aluminum foil, placed in a plastic bag, and immediately placed on ice (dry ice is preferred for quicker freezing of fish samples). Fish will be kept frozen until delivered to the laboratory for analysis.

Fish will be delivered to the Department of Fish and Game Water Pollution Control Laboratory at 2005 Nimbus Road in Rancho Cordova for analysis of total mercury from filets. Though the maximum holding time is 28 days, fish should be submitted to the laboratory within two weeks from the time they are collected to allow the laboratory sufficient time to schedule analyses. A Chain-of-Custody form (attached) should accompany the samples. Dave Crane of DFG at (916) 358-2858 should be given advance notice of at least several days prior to delivery of samples.

Table 1. Lakes and reservoirs for fish tissue analyses of mercury

DFG Region 1	DFG Region 2	DFG Region 3
Clair Engle (Trinity)	Antelope Lake	•Blue Lakes
•Copco Lake	•Bucks Lake	•Indian Valley Reservoir
•Lake Britton	•East Park Reservoir	Eagle Lake - need tui chubs
•Lake Shasta	•Mtn Meadows Reservoir	•Lake Almanor
•Lake Shastina	Frenchman Lake	•Sly Creek Reservoir
Ruth Reservoir	•Lake Oroville	•Little Grass Valley Reservoir
Whiskeytown Lake	•Stony Gorge Reservoir	

• completed

Responsibility

Scott McReynolds will be the lead person for this project. He will be responsible for obtaining all necessary sampling equipment and arranging crews and sampling dates. Other environmental specialists, scientific aids, and students will be available to assist in sample collection.